

REMARKS

Favorable reconsideration and allowance of this application are requested.

By way of the amendment instructions above, claims 8-10 have been presented for examination. In this regard, claim 8 is dependent from pending claim 1 and requires the foamed article to comprise cells with a maximum size of 100 μ m or less. Support for claim 8 can be found in the originally filed specification at page 16, lines 8-10 (“...a maximum size of the cells is 100 μ m or less.”).

New claim 9 is in independent format and is directed to a method of forming a foamed article comprising the steps of (a) injecting a resin molding composition comprised of a polyacetal copolymer resin (A) impregnated with a fluid (B) a supercritical state into a mold cavity having mold surface thermal conductivity of 5 W/m·K or less; and (b) allowing the resin molding composition to foam within the mold cavity to form a foamed article which comprises cells with a maximum size of 100 μ m or less and a surface roughness of 3 μ m or less. Support for new claim 9 can be found in original claim 7 (which constitutes its own disclosure) as well as at page 13, lines 11-13 (“...when the resin composition is injected from the injection unit into the mold, the pressure is released and the foam is started...”) and page 16, lines 17-18 (“...the surface roughness of the injection molded article is 3 μ m or less...”).

New claim 10 is dependent from claim 9 and requires the mold cavity to have a mold surface thermal conductivity of 4 to 0.1 W/m·K as supported at page 14, line 10 of the specification.

Therefore, following entry of this amendment, claims 1-10 will remain pending herein for which favorable reconsideration and allowance are requested.

Prior to addressing the substantive inappropriateness of the references of record, the Examiner will note that the applicant's corresponding European application has now

matured as EP Patent 1 553 128 B1. A copy of the EP '128 patent is attached and noted on an appropriate disclosure list. It will be observed that the claims which issued in the EP '128 patent are substantively identical to those presently pending in the subject application. Consideration of the EP '128 patent is requested for which purpose the fee required by Rule 98(c) is attached.

Original claims 1-5 attracted a rejection under 35 USC §103(a) as allegedly being unpatentable over Blakey et al, USP 3,253,967 ("Blakey et al"), Martivni-Vvedensky et al, USP 4,473,665 ("Martivni"), DE 1282971 to Celanese Corp. ("Celanese") in combination with Cha et al, USP 5,158,986 ("Cha") or Nishigawa et al, USP 5,997,781 ("Nishigawa") and further in view of either one of JP 7-126481 to Polyplastics, Co. ("JP '481") or JP 7-90161 to Polyplastics KK ("JP '161"). Claims 6 and 7 were separately rejected under the same statutory provision and the same references as claims 1-5 and further in view of JP 2000-71277 ("JP '277"). As will become evident from the following discussion, none of these applied references of record are appropriate against the claims pending herein for consideration.

Applicants note that the present invention is novel in several respects. For example, the present invention is novel in that foamed injection molded articles with low surface roughness may be obtained while maintaining excellent mechanical properties (see, e.g., paragraph in specification bridging pages 3-4). This is achieved according to preferred embodiments of the invention by using a polyacetal copolymer resin with a ***crystallization time of 5 minutes or more*** to uniformly generate many fine cells in the molded article.

Furthermore, the present invention achieves a foamed injection molded article which, while being devoid of a non-foamed surfaced layer, nonetheless exhibits a low surface roughness (e.g., 3µm or less) with excellent mechanical properties.

Turning attention to the applied primary references of record, applicants note that while each of Blakey et al, Martivni and Celanese may reasonably be considered to disclose foamed polyacetal resin articles using a supercritical fluid, there is no suggestion at all in such references of the criticality of using a polyacetal copolymer resin with a ***crystallization time of 5 minutes or more*** to uniformly generate many fine cells in the molded article.

The Examiner acknowledges this deficiency in the applied primary references of record by citing JP '481 and JP '161 for the proposition that polyacetal resins having a crystallization time of 5 minutes or more are known in the art. Applicants do not dispute that JP '481 and JP '161 disclose polyacetal resins having crystallization times of 5 minutes or more. However, applicants emphatically dispute the conclusion the Examiner has apparently reached that, just because on the one hand polyacetal resins have previously been foamed using supercritical fluids and on the other hand polyacetal resins having crystallization times of 5 minutes or more are known generally, the an ordinarily skilled person would have considered it obvious to employ the latter in the foaming process of the former. The evidence of record belie such a conclusion.

Specifically, as the Examiner is already apparently aware, Table 1 in the originally filed specification indicates there is no equivalency nor predictability of good results when using polyacetal resins in a foaming process with supercritical fluid. Thus, as will be noted, Comparative Examples 1 and 2 (CE1 and CE2, respectively) not embraced by the scope of the present claims employed polyacetal resins having a melting point of 163⁰C and a crystallization time of 2 minutes. Examples 1 to 4 (E1 to E4, respectively) which are embraced by the scope of the claims had melting points of 160 or 161⁰C and crystallization time of 5 or 15 minutes.

Significantly, the maximum cell size of the foam was 150 µm in CE1 and CE 2 as compared to a maximum cell size of 50 or 70 µm of the foams of E1 to E4. Similarly, the surface roughness of 8.0 µm and 6.0 µm for CE 1 and CE2, respectively, was

substantially greater as compared to the surface roughness obtained in the foams of E1 to E4.

To be sure, applicants are not claiming to be the first inventors generally of foaming polyacetal resin using supercritical fluids. Nor are the applicants claiming to be the first inventors of polyacetal resin generally having crystallization times of 5 minutes or more. And certainly applicants are not claiming to be first inventors of injection molding generally. Instead, applicants have discovered that foamed injection molded articles with low surface roughness may be obtained while maintaining excellent mechanical properties by using a polyacetal copolymer resin with a crystallization time of 5 minutes or more to uniformly generate many fine cells in the molded article. There is simply no suggestion in any of the references of record, absent the impermissible glare of hindsight, that combining the references in the manner suggested would achieve the attributes of the present invention.¹

Thus, although various components employed in the practice of the present invention may in fact be known individually in the art (e.g., foaming of polyacetal using supercritical fluid as disclosed in the primary references to Blakey et al, Martivni and Celanese; producing foams of various plastics materials injection molding as disclosed Cha or Nishigawa; and polyacetal resins having a crystallization time of 5 minutes or more as disclosed in JP '481 and JP '161), such individual art recognition would not result in a combination to achieve the attributes of the present invention.

As noted above, the evidence of record demonstrate that no equivalency nor predictability would be presented in terms of low surface roughness and small cellular size even as between polyacetal resins closely related in melting points and

¹ The Federal Circuit regards hindsight as an insidious and powerful phenomenon and is a tempting, but forbidden zone in the inquiry of addressing the statutory obviousness standard. See, e.g., *Panduit Corp. v. Dennison Mfg. Co.*, 227 USPQ 337 (Fed. Cir. 1985) and *Loctite Corp. v. Ultraseal Ltd.*, 228 USPQ 90, 98 (Fed. Cir. 1985).

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crystallization times. (i.e., 2 minutes viz. 5 minutes and 163⁰C viz. 160-161⁰C). This evidence of criticality therefore rebuts any assertion of "obviousness" to the contrary.

Therefore, withdrawal of the rejection advanced against claims 1-5 under 35 USC §103(a) is in order.

Only brief mention is believed to be needed with respect to the rejection of claims 6 and 7. As with the other references noted above, applicants do not dispute that injection mold cavities have in the past been provided with thermal barriers. However, as with such other references of record, such individual art knowledge would not equate to an "obvious" use with the particular polyacetal resins employed in the practice of this invention or the particular foaming process employed. Again, while some improvement did ensue with the use of a thermally insulated mold cavity, the improvement was not as substantial as that employed in the practice of the present invention (e.g., compare CE2 to E3). Most certainly, there is no suggestion or contemplation of a process which results in a foamed article having the attributes of new claim 9, specifically a foamed article which comprises cells with a maximum size of 100 μ m or less and a surface roughness of 3 μ m or less.

Withdrawal of the rejection advanced against claims 6 and 7 under 35 USC §103(a) is also in order.

Every effort has been made to advance prosecution of this application to allowance. Therefore, in view of the amendments and remarks above, applicants suggest that all claims are in condition for allowance and Official Notice of the same is solicited.

Should any small matters remain outstanding, the Examiner is encouraged to telephone the Applicants' undersigned attorney so that the same may be resolved without the need for an additional written action and reply.

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An early and favorable reply on the merits is awaited.

Respectfully submitted,

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